



Status and Socioeconomic Determinants of Farming Households' Food Security in Ngaka Modiri Molema District, South Africa

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Abstract

The global relevance of food security has attracted a plethora of research, because it is a determinant of either the prosperity or poverty of any nation. Accordingly, food security is directly associated with the poverty in many developing countries of the world today. Rural people around the world continue to struggle with food insecurity, persistent poverty and inequality, and environmental degradation. This necessitated a research study on food security in the North West province of South Africa, with a view to evaluate the food security status and its determinants in the area, as well as to compare the impact of gender on the food security status of households. A cross-sectional survey was conducted, where 346 maize farmers in the Ngaka Modiri Molema District Municipality of the North West, South Africa, were interviewed. A logically structured questionnaire was used to collect data where household expenditure survey was used to evaluate the food security status of these farmers, after which a logistics regression model was used to determine the factors responsible for food security. The findings reveal that, with more farming experience, the probability of household food security decreased. Also, an increase in the household size, by one member, decreases the probability of a household achieving food security. Similarly, a unit increase in the age of the head of household decreases the probability or likelihood of being food secured in the study area. The result also revealed that more than half of the farming households were food secure, while the female-headed households were more food secure, proportionately, compared to male-headed households.

Keywords Household food security status · Household expenditure survey · Logistic regression model · Gender dynamics · North West

Abbreviations

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IFAD International Fund for Agricultural Development
WFP World Food Programme

1 Introduction

Food is one of the essential needs for existence, thus making its accessibility a basic human right. The physical and economic access to sufficient, safe and nutritious food by the people at all times to meet their dietary needs and food preferences for an active and healthy life is termed food security (FAO 1996). That food security is an indispensable criterion for human wellbeing cannot be argued. For instance, food insecurity and poor health do not only limit the attainment of human potential and productivity, but also places a high social and economic burden on individuals, families, communities, nations and the world at large. Subsequently, the human pursuit to achieve a sustainable livelihood, in accordance with the United Nations Sustainable Development Goals (UN SDGs) for zero hunger, good health and wellbeing (goal 2 and 3, respectively), requires a sound understanding of the issues related to food security.

Intrinsically, the food security concern relates to the problem of poverty, which is noticeable in many developing countries. Besides, rural people around the world continue to struggle with food insecurity, persistent poverty and inequality, and environmental degradation. The global report on food crises, by IFPRI (2019), indicated that during the year 2018, about 113 million people experienced severe hunger and many countries were chronically vulnerable to the food crisis. Equally, the World Bank (2001) projected that, in many regions across the world, one out of five live in a condition of poverty, with an income of US\$1/day or less. Likewise, the Food and Agriculture Organisation, International Fund for Agricultural Development and the World Food Programme (FAO, IFAD and WFP 2015), in their report on the “State of Food Insecurity in the World”, found that approximately 795 million people in the world are malnourished and are therefore incapable of living a healthy and active life.

Additionally, sub-Saharan Africa is still regarded as the place that is experiencing the highest levels of food insecurity and this is because it has been noted that malnutrition and hunger particularly have always been the problem (Bwalya 2013). Moreover, statistics have shown that one in four people still remain chronically hungry in sub-Saharan Africa (FAO 2014). Congruently, in developing countries, one of the causes of food insecurity is attributed to poverty, which results in the incapability of the households to access enough and suitable food. Similarly, in South Africa, food security is a concern for the government and its development partners. Despite the political and economic advances experienced since 1994, the country remains plagued by unemployment, low income, poverty, food insecurity and ill-health (United Nations 2009). Although Hart (2009) and Hendricks (2005) reported that South Africa is nationally food secured, households at the grassroots level are food insecure.

South Africa is regarded as a middle-income country, characterised by large income inequality and poverty (Altman et al. 2009). Correspondingly, food insecurity and poor nutrition have been found to be prevalent among the rural and urban poor in South Africa, which is linked to unemployment. The rise in the cost of food is one of the contributing factors to food insecurity in South Africa. Since 2008, the average price of food items has been rising faster than the economy’s consumer inflation level (Ackerman 2012). Also, drought, low incomes and rising unemployment in South Africa remain some of the key

identified bedrock constraints to poor households' ability to access food. This evidently accounts for the unsatisfactory progress South Africa has made towards achieving the UN Sustainable Development Goals.

A food security report from African Food Security Urban Network (AFSUN), conducted in 11 southern African cities, explained that the high levels of food insecurity are mainly rooted in urban poverty (Crush et al. 2012). Ndobo and Sekhampu (2013) show that, decades after the political transition in South Africa, the country still experiences food insecurity, both in rural and urban areas. The duo recommended agricultural education among households in the South African township. Rural farming households in the Ngaka Modiri Molema District Municipality, in the North West province of South Africa, are not excluded from food security issues. In light of the recommendation by Ndobo and Sekhampu (2013) and as part of South Africa's national policy on food and nutrition security, which is in alignment with the UN Sustainable Development Goals 2030, a comprehensive analysis is needed to assess the food security status and determine the factors that contribute to food security.

Furthermore, even though several studies have been conducted on food security in South Africa, such research have been geographically limited, as none of these studies was specifically focused on the Ngaka Modiri Molema district, in the North West province. Neither has there been any documented study on food security among the rural household maize farmers in South Africa. Likewise, there is no research on the impact of gender dynamics on food security among rural household maize farmers in the study area. Hence, this study seeks to assess the household food security status (HFSS) among the rural farming heads of household in the study area. Other objectives of the study include: (1) to provide an analysis of the drivers of food security and (2) to determine the dynamics of gender on food security, by comparing female-headed households to their male counterparts. The relevance of the article will help to understand the drivers of food security and provide an assessment of the food security statuses of households through a household expenditure survey (HES) in the study area. Finally, the study will help to determine the dynamics of gender on food security, by comparing female-headed households to male-headed households. Subsequently, this will enable policymakers to make an accurate determination of the HFSS in this area and promote proper profiling in relation to the role that gender plays in attaining food security and their involvement in agriculture. Thus, there is need for the study to solve the issues highlighted.

2 Materials and Method

2.1 Study Area

The study was carried out in the North West province, which occupies 8.7% of the land area (106,512 km²) in South Africa. The province is located in the north of South Africa, and it shares a border with the Republic of Botswana—along the Kalahari Desert—to the west, the Gauteng province to the east and the Free State to the south. The North West consists of four district municipalities, namely: the Ngaka Modiri Molema District Municipality, Bojanala Platinum District Municipality, Dr Ruth Segomotsi Mompati District Municipality and Dr Kenneth Kaunda District Municipality. The districts are divided into 18 local municipalities. However, this study was carried out in the Ngaka Modiri Molema District Municipality. The district includes the capital of the province, which is situated

at the centre of the district municipality and the district shares a border with Botswana. The district consists of Mahikeng, Ditsobotla, Ramotshere Moiloa, Tswaing and Ratlou. The area of the district is 28,206 km² with a population of 842,699 (Stats SA 2017). The district was chosen because of its huge involvement in agriculture. The agriculture sector in the Ngaka Modiri Molema district contributes about 5% to the GDP and it is one of the largest maize production regions in South Africa, with a large majority of the people in the province earning their livelihood from agriculture, which contributes enormously to the promotion of household food security (Oduniyi 2018).

2.2 Population, Sampling Procedure, and Sample Size

Data was collected from the Ngaka Modiri Molema District Municipality in the North West, which consists of 5 local municipalities, as shown in Fig. 1 below. The number of small and emerging maize farmers in the district comprises about 575 farmers, as confirmed by a list obtained from the Department of Agriculture, Forestry and Fisheries (DAFF) and also from Grain SA. The smallholder farmers, in this regard, are described



Fig. 1 Map of Ngaka Modiri Molema district municipality. Source: Municipal Demarcation Board (2010)

as the users of only a very small patch of land, such as food plots ranging up to two hectares (Altman et al. 2009; International Fund for Agricultural Development 2011), while the emerging farmers operate on more than 2 ha, but are not classified as commercial farmers, as they do not have huge capacity, though they do partake in the market and have an intention to produce and sell more. The maize farmers were chosen for this research, because maize is the most important cereal crop in sub-Saharan Africa, and it constitutes a major staple food in South Africa, with the majority of the crop farmers planting maize. Additionally, South Africa is the second largest maize producing country in Africa, with higher concentrations of farmers coming from the North West, Free State and Mpumalanga provinces.

A Raosoft sample size calculator was used to determine the sample size from the population of small and emerging maize farmers in the study area. The sample size calculator took into account the confidence level, the response distribution and the margin of error, as indicated below:

$$x = Z(c/100)^2 r(100 - r) \quad (1)$$

$$n = Nx/(N - 1)E^2 + x \quad (2)$$

$$E = \text{Sqrt} [(N - n)x/n(N - 1)] \quad (3)$$

2.3 Data Collection

A stratified random sampling technique was employed to group the population of the farmers from the 5 local municipalities into strata, after which a random sample was used to select from each stratum. This method was used because of the specific homogenous subgroup within the district municipality. The technique ensures precision of the key group within the sample and reduces sampling error. A specific number for the sample size was selected from the population from each local municipality. A total of 346 respondents in the district participated in the research study. Approval to collect data was granted by each of the local municipality offices in the district. The data used in the research was primary and secondary data. Primary data was used to collect opinions from the farmers through the use of questionnaires, while the secondary data supplied additional information and other existing literature and evidence to interpret the primary data collected, through the use of published books and journals. The questionnaires were structured and consisted of a logical flow of questions regarding demographics, socioeconomic farm-based characteristics and food-related issues. Face-to-face interviews and focus group discussions were conducted in each selected area, with each session lasting 30 min. The questionnaire was explained to the local extension officers, before the survey commenced, because they understood the farmers better and could translate the questions into the local language.

2.4 Household Food Security Status (HFSS) Calculation

The household food security status was determined using the household expenditure survey (HES). Following Arene and Anyaeji (2010), this was achieved by calculating the per capita food expenditure of *i*-th household, divided by 2/3 mean per capita food expenditure of

all households, over a period of a month. The value obtained represents a threshold, which was used to construct the household food security index (HFSI). A household expense on food, above the threshold or HFSI, is regarded as food secure, while otherwise or lesser than the threshold is regarded as food insecure.

$$F_i = \frac{\text{per capita food expenditure for the } i\text{th household}}{2/3 \text{ mean per capita food expenditure of all household}}$$

where F_i is the household food security index

Mathematically, when:

$F_i \geq 1$ = the i th household is food secure

$F_i < 1$ = the i th household is food insecure.

Hence, any household with a per capita monthly food expenditure above or equal to two-thirds of the mean per capita food expenditure is considered to be food secure, while otherwise is considered to be food insecure.

2.5 Data Analytical Techniques

Descriptive statistics such as percentages, frequency counts, mean values, variance and standard deviation were used to describe farmers' socioeconomics, farm-based characteristics and household food security status (HFSS). Equally, a logistic regression model was used to identify the factors that determine food security status. This model was considered appropriate, because of the dichotomous nature of the independent variable. Likewise, it was appropriate for the study, because of the interpretation of coefficients in terms of odds ratios needed for the explanation of the results. In this study, a respondent who is food secured was accounted for "yes" (coded 1) and "no" (coded 0) otherwise. The model can be expressed mathematically as follows:

Food secured is expressed as P_1

Food insecure as P_0

Let Y be a binary response variable

$Y_i = 1$, Respondent is food secure i

$Y_i = 0$, Respondent is not food secure i

$X = (X_1, X_2, \dots, X_k)$ be a set of explanatory variables which can be discrete, continuous, or a combination. X_i is the observed value of the explanatory variables for observation i .

Assuming that food security status is a function of the gender of the household head (X_1), age of the household head (X_2)... X_n . The initial model will be given as:

$$Y = \alpha + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \beta_4x_4 + \beta_5x_5 + \dots + \beta_kx_k + \varepsilon \quad (4)$$

where, the variable ε is called the error term or disturbance. It is termed "noise" reflecting other factors that influence food security status. It captures the factors other than X affecting Y .

Y = dependent variable

X = independent variables

β_i = regression coefficients
 α = is the constant term

The model for logistic regression analysis assumes that the outcome variable, Y , is categorical (e.g., dichotomous). Hypothetically, population proportion of cases for which $Y = 1$ is defined as $p = P(Y = 1)$. Then, the proportion of cases for which $Y = 0$ is $1 - p = P(Y = 0)$. In the absence of other information, we can estimate p by the sample proportion of cases for which $Y = 1$. However, in the regression context, it is assumed that there is a set of predictor variables, X_1, \dots, X_k , that are related to Y and, therefore, provide additional information for predicting Y .

$$\text{Logit}(P_i) = \ln(P_i / 1 - P_i) = \alpha + \beta_1 X_1 + \dots + \beta_n X_n + U_i \tag{5}$$

where, $\ln(P_i / 1 - P_i)$ = logit for respondents' food security status (Yes or No); P_i = Respondents who are food secure; $1 - P_i$ = Respondents who are not food secure; β = coefficient; X = covariates; U_i = error term

Then, the logistic regression model can be expressed as:

$$\text{logit}(p) = \log\left(\frac{p}{1-p}\right) = \log(p) - \log(1-p) = -\log\left(\frac{1}{p} - 1\right). \tag{6}$$

The "logistic" function of any number α is given by the inverse-logit (Table 1):

$$\text{logit}^{-1}(\alpha) = \frac{1}{1 + \exp(-\alpha)} = \frac{\exp(\alpha)}{\exp(\alpha) + 1} \tag{7}$$

$$\log(R) = \log\left(\frac{p_1 / (1 - p_1)}{p_2 / (1 - p_2)}\right) = \log\left(\frac{p_1}{1 - p_1}\right) - \log\left(\frac{p_2}{1 - p_2}\right) = \text{logit}(p_1) - \text{logit}(p_2) \tag{8}$$

$$\log\left(\frac{p_i}{1 - p_i}\right) = \alpha + \beta_1 X_{i1} + \beta_2 X_{i2} + \dots + \beta_p X_{ip} \tag{9}$$

3 Results and Discussion

Descriptive statistics presented in this section summarised the heads of household demographics and farm-based characteristics. According to one of the objectives stated, Table 2 revealed that, by comparing gender in relation to food security status, male-headed households (84.1%) were more than their female-headed counterparts (15.89%). Equally, about 157 male-headed households (54%) were food secured, while the remaining 134 (46%) were not. On a same note, about 31 female-headed households (56.4%) were food secured, while 24 of them (43.6%) were food insecure. However, equating the proportion of food security status, female-headed households (56.4%) were found more food secured compared with the male counterpart (54%). This could be attributed to the fact that rural female-headed households were able to engage in different types of agricultural activities such as gathering of food, trading and processing of small-scale agricultural produce, which generates more income, and, at the same time, women had access to grants,

Table 1 Definition and explanatory variables used in the binary logistics regression model. Source: Author's computation (2018)

Dependent variable		Household food security status
Food insecure		Y = 0
Food secure		Y = 1
Explanatory variables	Descriptions	Expected sign
Farming experience (years)	Number of years in farming	+
Farm size (ha)	Size of the farm cultivated	+
gender	1 if Male, 0 if Female	±
Age (years)	Age at the time if interview in years	+
Household size	Number of household members	+
Household income (R)	Income earned in a month	+
Marital status	1 if Male, 0 if Female	±
Education	Number of years spent in school	+
Access of extension	1 if have access, 0 if otherwise	+
Frequency of visit	Number of visitations to the farm	+
Farming as a source of income	1 if yes, 0 if otherwise	+
Other sources of income	1 if salary, 2 if grants, 3 if none	+
Access to irrigation	1 if have access, 0 if otherwise	+
Source of irrigation	Source of irrigation to the farm	+
Member of coop	1 if yes, 0 if otherwise	+
Access to input	1 if yes, 0 if otherwise	+

especially old-age and children's grants, which enabled them to support their households. Equally, the number of rural male-headed households was more than the female-headed households, because women have limited access to land and technical skills.

3.1 Distribution of Household Food Security Status (HFSS)

Table 3 explicitly illustrates that about 188 (54.3%) of the heads of household are food secured. This could possibly be attributed to the fact that the majority of the heads of household are able to afford and buy food items for the households and, perhaps, depends on additional income outside of farming. This is a plausible reality, since the majority of the heads of household had equal access to other sources of income in the form of wages, old-age and children's grants. According to Table 4, it was shown that the minimum household expenditure per month is R640 (USD 42,89), with R79.00 (USD 5,29) per capita food expenditure, while the maximum household expenditure is R2650 (USD 177,58) with R640.00 (USD 42,89) per capita expenditure. Also, the minimum household income per month is calculated to be R1850 (USD 123,97), while the maximum household income is R4100 (USD 274,75).

The findings show that the minimum age of the head of household was 24 years, while the maximum age was 78 years. The minimum household size was 2, while 13 was the

Table 2 Descriptive statistics of socioeconomic variables. Source: Author's computation (2018); N=346

Explanatory variables	Food secure = 188 (54.3%)	Food insecure = 158 (45.7%)	Total
<i>Farming experience</i>			
Less than or 10 = 1	64 (56.1)	50 (43.9)	114
11–20 = 2	86 (62.8)	51 (37.2)	137
Above 20 = 3	38 (40.0)	57 (60)	95
<i>Farm size</i>			
Less than 5 = 1	85 (56.7)	65 (43.3)	150
Above 6 = 2	103 (52.6)	93 (47.4)	196
<i>Gender</i>			
1 = Male	157 (54.0)	134 (46)	291
2 = Female	31 (56.4)	24 (43.6)	55
<i>Age</i>			
Less than or 40 = 1	74 (69.16)	33 (30.84)	107
Above 41 = 2	114 (47.70)	125 (52.30)	239
<i>Household size</i>			
Less than or 6 = 1	166 (67.20)	81 (32.80)	247
Greater than or 7 = 2	22 (22.22)	77 (77.78)	99
<i>Household income</i>			
Less than R2000 = 1	51 (51.0)	49 (49.0)	100
R2001 – R4000 = 2	121 (55.0)	99 (45.0)	220
R4001 – R6000 = 3	16 (61.5)	10 (38.5)	26
<i>Marital status</i>			
Unmarried = 1	85 (68.0)	40 (32.0)	125
Married = 2	103 (46.61)	118 (53.39)	221
<i>Education</i>			
Uneducated = 1	111 (48.68)	117 (51.32)	228
Educated = 2	77 (65.25)	41 (34.75)	118
<i>Access to extension services</i>			
Yes = 1	103 (55.4)	83 (44.6)	186
No = 2	85 (53.1)	75 (46.9)	160
<i>Frequency of visit</i>			
Once = 1	68 (54.8)	56 (45.2)	124
Twice = 2	32 (55.2)	26 (44.8)	58
3 X = 3	0 (0.0)	0 (0.0)	0
4 X = 4	0 (0.0)	0 (0.0)	0
More than 4 X = 5	0 (0.0)	0 (0.0)	0
None = 6	75 (47.2)	84 (52.8)	159
<i>Income sources</i>			
Yes = 1	132 (54.1)	112 (45.9)	244
No = 2	56 (54.9)	46 (45.1)	102
<i>Other income sources</i>			
Salary & Wages = 1	44 (53.0)	39 (47.0)	83
Old age grant = 2	13 (65.0)	7 (35.0)	20
None = 3	131 (53.9)	112 (46.1)	243

Table 2 (continued)

Explanatory variables	Food secure = 188 (54.3%)	Food insecure = 158 (45.7%)	Total
<i>Access to irrigation</i>			
Yes = 1	103 (55.4)	83 (44.6)	186
No = 2	85 (53.1)	75 (46.9)	160
<i>Source of irrigation</i>			
Government = 1	55 (56.7)	42 (43.3)	97
Individual = 2	19 (61.3)	12 (38.7)	31
NGO = 3	29 (50.9)	28 (49.1)	57
None = 4	85 (52.8)	76 (47.2)	161
<i>Member of coop</i>			
Yes = 1	105 (56.5)	81 (43.5)	186
No = 2	83 (51.9)	77 (48.1)	160
<i>Access to input</i>			
Yes = 1	97 (54.2)	82 (45.8)	179
No = 2	91 (54.5)	76 (45.5)	167

1 US dollar to South African Rand = 14.92, as at 22 September 2019, 09.22 am

Table 3 Distribution of household food security status (HFSS). Source: Author's computation (2018)

Food security status	Frequency	Percentage
Food secure	188	54.3
Food insecure	158	45.7
Total	346	100

Table 4 Summary statistics of selected respondents' socioeconomic variables. Source: Author's computation (2018)

Socioeconomics variables	Minimum	Maximum	Mean	Variance (n)	Standard deviation (n)
Household expenditure (R)	640.000	2650.000	1433.295	187,026.965	432.466
Per cap food expenditure (R)	79.000	640.000	291.055	8549.815	92.465
Household income (R)	1850.000	4100.000	2408.905	331,681.838	575.918
Household head age	24.000	78.000	53.315	218.904	14.795
Household size	2.000	13.000	5.630	8.464	2.909
Farming experience (years)	2.000	38.000	15.962	80.493	8.972

1 US dollar to South African Rand = 14.92, as at 22 September 2019, 09.22 am

maximum household size. Few rural household had a minimum of 2 years' farming experience, whereas the maximum farming experience was 38 years.

Table 5 Socioeconomic determinants of farming households' food security. Source: Author's computation (2018)

Variables	Coef.	Exp(B)	Robust SE	Marginal effects	P> z
Farming experience	-0.351*	0.704	0.199	-0.087	0.079
Farm size	-0.010	0.990	0.283	-0.002	0.972
Age of the household head	-1.275***	0.279	0.388	-0.296	0.000
Household size	-2.207***	0.110	0.359	-0.495	0.000
Household head income	0.171	1.187	0.229	0.0424	0.455
Gender	-0.081	0.923	0.355	-0.020	0.820
Household head marital status	0.052	1.054	0.341	0.013	0.879
Household head education level	-0.068	0.935	0.279	-0.017	0.809
Farming as a source of income	0.179	1.196	0.835	0.044	0.831
Other sources of income	-0.059	0.943	0.441	-0.015	0.894
Access to extension services	-0.172	0.842	1.466	-0.042	0.907
Frequency of extension visit	0.035	1.035	0.246	0.009	0.887
Source of irrigation	-0.197	0.821	0.201	-0.049	0.327
Member of coop	0.322	1.380	0.452	0.080	0.475
Access to agricultural inputs	-0.291	0.748	0.289	-0.072	0.312
Constant	2.560	12.928	2.765		0.355

Number of obs = 346

LR chi2 (15) = 141.47

Prob > chi2 = 0.0000

Pseudo R2 = 0.2966

Log likelihood = -167.78945

*, **, ***Significant at 10%, 5%, and 1%

3.2 Factors Driving Food Security in the Study Area

The binary logistic regression model, as presented in Table 5, indicates that the farming experience of the rural household head was associated and statistically significant ($p < 0.1$) to the food security status, with a negative coefficient (-0.351). The result ascertained that the food security status in the study area decreased with farming experience. Evidently, with farming experience, the probability of household food security decreased. This implies that farming experience decreases the probability of households being food secure with an odds ratio of 0.704. A unit increase with the household farming experience decreases the probability or likelihood of being food secured. This, however, is not surprising, as the majority of the farmers did not increase their production output, despite their wealth of farming experience. The farmers, who have more farming experience, still produced low outputs due to a lack of resources, which would be needed to increase outputs. Most of the rural heads of household operate a small portion of land, which was believed to be a coping strategy or agricultural risk in the face of climate change, as farmers have little or no resources. Although, it was expected that farming experience would increase farmers' food security status, the reverse is true in this study area.

Table 5 shows that household size was statistically significant ($p < 0.05$), with a negative coefficient (-2.208); in other words, an increase in household size is more likely

to decrease the probability of attaining food security, with an odds ratio of 0.109. This is a clear indication that the odds of being food secure (“yes” category) is 0.109 times greater for a household size of 7 and above, as opposed to the other category, household size of 6 and below. An increase in the household size, by one member, decreases the probability of a household achieving food security by 49.458%. The food security status of farmers decreases with an increase in the size of the household. This simply denotes that an increase in the household size is tantamount to an extra burden on the head of household, as it could lessen the available resources, consequently affecting the food security status. This result is also confirmed by Gebre (2012), as well as Baltenweck and Staal (2007), who reported a negative association between an increase in household size and food security status.

The result on Table 5 shows that food security status decreased with the age of the household head. The age of the household head was statistically significant ($p < 0.05$), with a negative coefficient (-1.275), which further affirmed that the odds of being food secure (“yes” category) is 0.279 times greater for older household heads (41 years and above in age), compare with the younger household heads (40 years and below). The result confirmed that food security is less likely to be attained with an increase in the age of the head of household. This implies that the probability of the household being food secure decreases with the increase in the age of the household head with an odds ratio of 0.279. A unit increase in the age of the head of household decreases the probability or likelihood of being food secured by 29.57%. Subsequently, based on this finding, it can be inferred that older heads of household have a low tendency of adopting improved technology in agriculture; therefore, it follows that this could pose a negative impact on food production and, consequently, little income to spend on food items. This

Table 6 Marginal effects after logit. Source: Author’s computation (2018)

Variables	Dy/dx	Z	X
Farming experience	-0.087	-1.760	1.945
Farm size ^a	-0.002	-0.040	0.566
Age of the household head ^a	-0.296	-3.610	0.691
Household size ^a	-0.495	-8.050	0.286
Household head income	0.042	0.750	1.786
Gender ^a	-0.019	-0.230	0.841
Household head marital status ^a	0.013	0.150	0.639
Household head education level ^a	-0.017	-0.240	0.341
Farming as a source of income	0.044	0.210	1.295
Other sources of income	-0.015	-0.130	2.462
Access to extension services ^a	-0.042	-0.120	0.054
Frequency of extension visit	0.009	0.140	3.494
Source of irrigation	-0.049	-0.980	2.815
Member of coop	0.080	0.710	0.538
Access to agricultural inputs ^a	-0.072	-1.010	0.517

$y = \text{Pr}(\text{HFSS})$ (predict)

$= 0.54728219$

^ady/dx is for discrete change of dummy variable from 0 to 1

*, **, ***Significant at 10%, 5%, and 1%

Table 7 Predictive margins.
Source: Author's computation
(2018)

	Margin	Delta-method SE	Z	P > z
._Constant	0.543	0.023	23.230	0.000

Number of obs = 346

Model VCE: Robust

Expression: Pr(HFSS), predict ()

discovery is supported by Ahmed et al. (2017), who confirmed that food security status had a negative association with the age of the head of household (Tables 6 and 7).

4 Conclusion

The study has examined the status of food security and the socioeconomic determinants of farming households in the Ngaka Modiri Molema District Municipality of the North West province of South Africa. Consequent upon that, the findings from the research revealed that there were more male-headed households than female-headed counterparts. However, the comparison between gender dynamics and equating the proportion of food security status, it was discovered that female-headed households (56.4%) were more food secured compared to the male counterpart (54%). Consequently, the food security status of farmers in the study area (using the household expenditure survey HES) has improved since 1994, as most farming households from the sample collected are food secured and the situation regarding the subject matter (nutrition and health) is becoming noticeable. Factors such as the age of the head of household and household size were found significant, at $p < 0.05$, respectively. Likewise, the farming experience of the household head was statistically significant, at $p < 0.05$, and drives the status of food security among the farming households in the study area. On the whole, the crux of the findings in this study revealed that the household size, age and farming experience of the household head contributed to achieving food security in the study area.

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Compliance with Ethical Standard

Conflict of interest The authors declare that there is no conflict of interest.

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